

## SNAKES AND LADDERS

### Depicting Evolution: Conceptions and Preconceptions

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"I thought it was a stupid prank. I'm in charge of this notice board, you know. It's my responsibility to organise it".

'Biology in the news' says the sign above the notice board in the foyer of the Division of Environmental and Evolutionary Biology. Clutching the screwed remains of my notice which had half a minute previously been ripped off the board and discarded, I asked, incredulous and stroppy, if The Organiser alone had permission to post items. Apparently not, which is probably as well because I had in the past pinned up the odd item myself: a picture of a two-headed snake from an Asian newspaper which I had found wrapping some chillies. And the one that I had now picked off the floor at The Organiser's feet. The snake (an arresting and slightly disturbing picture, but a developmental hiccup of minor biological significance; the script, Hindi I think, was lovely though) had remained on the board for about a year. The one now in my hand had survived only three weeks before I stumbled upon the process of it being Organised away. It was a request for votes in response to the largest and boldest item on the board, a colour two-page spread from 'The Times' magazine which greets DEEB staff, students and visitors each morning as it has for over a year and a half. 'Please Vote' I had printed, 'Do you think that this picture is a useful representation of evolutionary history?'. Boxes were provided for ticks, labelled 'yes', 'no, and 'undecided'. A pen hung up on a string.

The picture from 'The Times' is one that must be familiar, in generic form, to virtually everyone in the western world. At the far left, an early multicellular organism of curious structure, suggested as a possible ancestor of the backboneed animals. Next (a considerable leap here, but the direction is the same as in all such representations) comes the sail-backed *Dimetrodon*, an early reptile belonging to a group believed to be ancestral to mammals. Then a rather more mammal-like reptile, followed by a couple of 'primitive' mammals. Next, in order, a tree shrew (representing a primate ancestor), an early primate (rather like a modern bush-baby), an ape, and then a stooping and disreputable-looking Australopithecine. This sequence goes from early and small at the left and sweeps right across the double page and upwards to the culmination: erect man, *Homo erectus*, the precursor of modern humans. Walks tall, walks straight and looks the world right in the eye.

As often seems to be the case in these pictures, scale is deeply compromised. *Dimetrodon* has shrunk, tree shrew has expanded. Physical scale is binned: it seems that such sacrifice is acceptable in formulating the illusion of a 'forward and upward' evolutionary progression towards humanity. I'm not the first to note that when people fabricate their icons, accuracy takes a back seat. Similarly, I'm not the first to question this icon in particular: far from it, indeed in certain circles a coherent dogma has developed around admonishing perpetrators of this *faux pas* of evolutionary biology. Leading the way (being currently one of the most famous biologists in the

world, and certainly one of the most verbose) is Stephen Jay Gould. The argument is as follows: evolution does not progress as a ladder with humanity occupying the uppermost rung, or as a march of increasing virtue towards the human condition. Gould's preferred metaphor is the 'luxuriant bush'. Multitudinous branches, born in speciation and pruned by extinction, radiate in a verdant tangle of diversity. The ladder icon not only fails to recognise this pattern, but it falsely gives the impression of progress towards a human end-point. The modern bush-baby (which, in Gould's view, it seems we all are) mentioned above is 'as evolved' as a human: its lineage is as old, and like us it is the living descendant of the survivors of natural selection. One could with equal (equally weak) justification create a similar icon with this cuddly wide-eyed fur ball at the apex: an iconic history of cute, if you like. The real problem, however, becomes manifest when this misleading representation is combined with the human predilection for hierarchical thinking. From the ladder comes the idea of progress, of the 'new and more human' replacing the 'old and primitive'. As is borne-out by the many examples hunted down by Gould, it has proved all too easy to slot in, despite the vacuous absence of scientific justification, 'African' behind 'European, or 'Jew' behind 'Aryan'. And of course, perhaps most insidious of all, always behind the human comes the entire non-human population of the planet.

Why, then, given the difficulties outlined above, has this representation of evolution become a fixture of our cultural life? Gould's writing on the subject gives the impression that the blame lies squarely with the aforementioned hierarchical organisation of much human thought: that the misrepresentation of history results from an attempt to accommodate preconceived ideas of what is 'primitive' and 'bad' and what is 'advanced' and 'good' in an evolutionary context. Through his typically exhaustive and erudite collection of examples, one can clearly see this effect in operation. There is another factor, however, which appears to have been overlooked in a case of 'not seeing the wood for the trees': simply, that people have an inordinate fascination for their ancestors.

The picture which dominates the notice board in the foyer accompanies an article about human ancestors. Each of the steps on the evolutionary 'march' is a representation of what, given a fairly scientific guess, various animals on the direct human lineage might have looked like. They are impressions of our ancestors. The editor of that magazine understood that we all want to see, touch, the ancestors. Now, a writer as venerable as Gould, perhaps, would at this point embark on a passionate and detailed treatise on the pervasive cross-cultural nature of the human obsession with ancestors. As it is, I find little half-known snippets of information gleaned from half-forgotten sources jumping into my head: Japanese religion, American Indian culture, talks told to Bakka children, my own father telling me of our family history. I am clearly

not Gould. However, this is in one way a blessing because it does present an opportunity to use the man himself as an example of just how powerfully attractive the idea of direct lineage can be.

The undeniably lofty position that Gould occupies amongst biologists (I am told that when he visits here the sycophants come out of the woodwork: would probably be there myself, given the chance) comes at a price. There is a steady stream of creationist dogma to be addressed and he is in the front line. With characteristic vigour and stamina, creationists continually point to the paucity in the fossil record of intermediate forms between one distinctive group and another, point to links that are missing. If, as evolutionary biologists claim, whales developed from terrestrial four legged mammals via the slow grinding of natural selection, surely one should find evidence of animals which occupied the extensive structural middle ground between these forms. However, with some notable exceptions, few 'intermediate' fossils have been found. Gould's stance in this argument is unambiguous. He is champion, indeed co-perpetrator, of the idea that the norm in nature is for extended periods of stasis (forms changing little with time) punctuated by short bursts of rapid evolutionary change in small, peripheral and geographically isolated populations. Any effective innovations thus arising spread relatively quickly via successful reproduction and colonisation, and the (famously patchy) fossil record is left with the observed pattern: the presence of one general form for extended periods and then the 'sudden' appearance of quite different forms. A scarcity of fossilised intermediates is precisely what one would expect under this scenario, and so invoking the creative intervention of a deity is rendered unnecessary.

In his latest collection of essays, Gould delights in the recent discovery in Pakistan of early whale fossils (Gould 1996). Palaeontological delight. I suspect that to him, holding a fossil is about as exciting as contact with an inanimate object can ever be, and I know exactly how he feels. The essay positively brims over with excitement, articulated gloriously. The palaeontologists in Pakistan have found a whole range of intermediate forms between terrestrial quadrupeds and whales, all in exquisite sequence from the shallows gud-dler to the consummate diver of blue-black depths. And as ever, I delight in his delight. However my own is, unfortunately, tempered. I see the punctuated equilibria of evolution. I see the luxuriant bush. And to me, the chances that these fossils are the remains of animals on the direct whale lineage depend precisely on just how luxuriant the bush actually was. Which we do not know. Could these 'perfect intermediates' actually be representatives of extinct lineages? Of course they could. And, as Gould has adopted the more 'luxuriant' position on these things (Gould 1989), one might expect him to concentrate somewhat more on this possibility. So why has he not? Why does he directly infer information on the mechanics of the terrestrial-aquatic transition based on these fossils? Is it because such a transition is an impossible mystery that thirsts for any pointers as to an explanation? This would seem unlikely: assuming (as, it could be argued in his own logic, he should) that these are perhaps not actually ancestral whales, then as much if not more could surely be learned from living animals that are also not ancestral to modern whales, but which are semi-aquatic mammals, e.g.

otters and seals. Or, could it simply be that after years of explaining to the creationists why the fossil record is not actually at odds with evolutionary theory, a rare chance to stick up the fingers and say 'there's your intermediate form, pal' was too good to miss? Well, maybe, but I don't think so. This essay is not an attack on Gould. Some have criticised him for allowing his emotions and politics to obscure objectivity. I for one find it impossible to feel anything but admiration and friendliness towards someone with such burning fascination for the natural world. And to me, Gould's piece is really about this fire: an ode to the thrill of the direct lineage. He knows, and indeed pays lip service to the idea, that these fossils might well represent 'failed' phylogenies, but the finds are so subjectively convincing that the excitement is too much to conceal. The idea that we now hold in our hands the ancestors of whales.

Gould is a professional palaeontologist. The discovery of evidence relating to the evolution of a group that interests him led to him forsaking, lightly and temporarily, the philosophy that forms that backbone of his general ideas on the history of life. Most people are not professional palaeontologists. The group that really interests them is, of course, *Homo*. When the subject of evolution arises, the call is for a peek at the ancestors. Authors, dutifully aiming to satisfy, attempt to recreate the direct human lineage, replete with images of 'granddad, the monkey', 'great granddad, the slime mould' (accuracy sitting quietly in its place on the back seat). Sadly, the philosophy of equality in diversity is (one hopes lightly and temporarily) forsaken in the resulting image. However, if an icon which graphically touts our animal origins is accepted and propagated by society, perhaps a loss of perspective and accuracy is acceptable, even a historical necessity. Can we forget that in the richest country in the world, in 'the land of the free', legions of people still see the very idea of evolution as blasphemous, the notion of humans having animal origins, anathema?

Allow me to return to the notice board in our foyer. Imbued, involuntarily, with the above thoughts, and seeing the famous 'icon' every working morning for many months, I felt compelled to come to some sort of decision as to my own stance on this matter. True to form, I boldly decided that I was undecided. And being so, naturally the next step was to wonder how others working in the Division felt on this issue. Hence the request for votes. In the increasingly competitive atmosphere of scientific institutions, researchers have understandably become increasingly embroiled in their own narrow fields. Consequently there is, in our Division, surprisingly little interchange on the wider evolutionary issues, and I find this frustrating. I want to discuss and learn about macro-evolution. With the notice, I had hoped to induce some discussion. Stupid, perhaps, but not a prank. And the votes? Do people working and studying in the Division think that the picture is a useful representation of evolutionary history? In the three weeks, ten people voted: six 'no's, three 'undecided', one 'yes'. Couldn't decide whether I should vote myself, and so I didn't. If I had, it would have been undecided. Probably.

Writing is a most effective catharsis, and I am no longer indignant at the summary scrapping of my notice. All our opinions and beliefs are formed by our experience of, and interaction with, the people around us. Unsurprisingly, then, I

see in myself now a small but decisive change in my personal view of the problem that is the theme of this essay. The Organiser is not an unkind man. Nor is he an egotist, or a bigot. On the contrary, he is actually a gentle and interesting man, and if hard work, creativity and rigor are the hallmarks of a good scientist, then he is clearly very good indeed. Furthermore, I can thank him for galvanising, albeit (no doubt) temporarily, my own indecisive thinking on the icon. The remark that opens this essay was indeed made in exactly those words, but the tone of his speech is important: he spoke softly, almost apologetically. He really did think that it was a prank. Perhaps I flatter myself, but I had at the time, and still have, a feeling that he wanted to apologise for a judgement made in haste (The Organiser is one of the busiest people in this building). Nonetheless, he did not. Something stopped him, and I think I know what it was: the hierarchy of status which dominates academia. He is Lecturer, I am student. People's heads are full of ladders. These days I'll stand behind Gould and defy them. Now, my vote would be no.

I am a healthy, white, middle-class, protestant male in higher education, surely one of the most over-privileged and cosseted people on the face of the earth. And this microscopic, utterly trivial injustice was enough to push me into the 'get the bush right, accommodate the diversity, or don't bother at all' school of thought. Gould is a Jew. Much of his writing I like, large portions I do not: often, I cannot help seeing snobbishness and false modesty in the work. But his greatest (I use the word carefully and earnestly) work, for me, is his mercurial annihilation of scientific racism and negative eugenics. On Auschwitz, the Third Reich, the use of science to justify murder or sterilisation, Gould's words form a terrible blossom: steely logic pouring from a man's heart. Let him topple the ladders in people's heads. Perhaps he can see where they ultimately lead.

#### REFERENCES

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